

REMARKS

Claim 8 has been amended for clarity.

New claims 11-13 are product-by-process claims similar to claims 8-10 that include a method for producing the claimed triethanolamine (TEA). Claims 14-19 dependent from claim 11 more specifically define features of the method of claim 11. Support for these claims can be found in original claims 1-7.

New claims 20-24 are more specifically drawn to the composition of a triethanolamine-based mixture having the same properties as the triethanolamine of claims 8-10. Support for these claims can be found on page 10, line 24 to page 11, line 4.

A significant feature of applicants' invention is that the triethanolamine or the more specific triethanolamine-based mixture has a color index of less than 120 Hazens, preferably less than 80 Hazens and more preferably less than 40 Hazens after the TEA or the TEA-based mixture has undergone a hot-ageing test at 140°C in an inert atmosphere for a period of 4 hours. (Feature iv) of claims 8-19 and ii) of claims 20-24). Heretofore, it has not been possible to obtain triethanolamine or a triethanolamine-based mixture as claimed with such a significant color index. This provides the TEA with a high thermal stability over time avoiding discoloration thereof.

As noted on page 1 of the specification TEA must be colorless, especially in fields such as pharmacy and cosmetology. Thus if it gradually colors over time it loses its acceptance and hence its value.

While the TEA has to have a purity equal to or greater than 99.2% by weight to have the required color index, the color index achieved is not a result of its purity level. In fact, as noted from page 1, line 22 to page 2, line 3, coloration and instability

phenomena in TEA over time occur more often when the TEA is pure, and more particularly for a high purity TEA, of for example, more than 99% by weight.

In this regard, reference is made to the Merck Index article cited by the Examiner which notes that TEA "Turns brown on exposure to air and light." Also, attached is a copy of page 1027 of Dictionnaire de la Chimie et de ses Applications which notes that TEA is an "oily liquid darkening with air" as well as page 174 of Ethylene Glycols, Glycol Ethers and Ethanolamines which notes with TEA "ordinary steel tanks are satisfactory for storage unless coloration of the product cannot be tolerated."

Rather, the claimed color index of the TEA or TEA-based mixture is achieved by the way it is made.

In the Office Action, the Examiner rejected claims 8-10 under 35 U.S.C. §102(b) for being anticipated by The Merck Index, 12th edition No. 9798. In making this rejection, the Examiner maintained that triethanolamine having "particular purity characteristics" is not of patentable significance. Applicants agree. In fact as noted above and in the specification, applicants have acknowledged that high purity TEA (i.e., over 99% purity) is known.

However, what this known "high purity TEA" did not have, nor does the TEA of the Merck Index have admitted therein, is the high coloration stability of the TE A of claim 8 as demonstrated by the claimed color index. Thus applicants are not just claiming a particular purity characteristic, but also a color index characteristic not heretofore obtainable.

Since this claimed color index is not disclosed in the Merck Index, and it was not possible heretofore to obtain such a TEA having such a low color index, it is not seen

how claims 8-11 can be considered anticipated by The Merck Index. Its withdrawal as a ground of rejection of the claims is therefore requested.

Regarding claims 11-19 which are product-by-process claims, it is believed these claims should be patentable for the same reasons as expressed above which recite the color index of the TEA and also for the same reasons the method claims were considered patentable in parent application Serial No. 10/169,579 filed October 18, 2002, now U.S. Patent No. 6,683,217.

Finally, regarding claims 20-24 drawn to a TEA-based mixture, it is believed these claims should be patentable for the same reasons expressed above with relation to the color index of the mixture and also because they include the composition of the TEA-based mixture, i.e., broadly 99.2 to 99.7% by weight of TEA, from 2000 to 50 ppm of a secondary dialkanolamine and optionally from 500 to 10 ppm of monoethanolamine. No such composition is disclosed in The Merck Index reference.

It is believed claims 8-24 are in condition for allowance and such action is therefore requested.

In view of the foregoing amendments and remarks, Applicants respectfully request reconsideration and reexamination of this application and the timely allowance of the pending claims.

Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

Respectfully submitted,

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Attachments: Copy cover and pages VI and 1027 of Dictionnaire de la Chimie et de ses Applications and cover and page 174 of Ethylene Glycols, Glycol Ethers and Ethanolamines.

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DICTIONNAIRE
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- tricrosyle (phosphate de)**, n. m. — Ester de f. $\text{PO}_4(\text{C}_7\text{H}_7)_3$; plastifiant pour vernis; ignifuge, agent de déphénolage des eaux de cokerie.
- tricyanamide**, n. m. — Solide de f. $\text{C}_3\text{H}_6\text{N}_6$. = AZAMINE, CYANURAMIDE, MÉLAMINE.
- tricyanique**, adj. = CYANURIQUE.
- tricyanométhane**, n. m. = CYANOFORME.
- tricyclamol**, n. m. = TRICYVAGOL.
- tricyclène**, n. m. — Carbone d'hydrogène $\text{C}_{10}\text{H}_{16}$ ou triméthyl-1, 2, 2 méthylène-3, 6 bicyclohexane [0-1-3].
- tricyclique**, adj. — Se dit d'un corps organique dont la formule comporte trois cycles.
- tricyclodécane**, n. m. = ADAMANTANE.
- tricyclo-ékasantalique**, adj. — Se dit d'un aldéhyde de f. $\text{C}_{13}\text{H}_{18}\text{O}$, dérivant du santalol- α par oxydation à l'ozone. = ÉKASANTALAL TRICYCLIQUE.
- tricyvagal**, n. m. — Dénomination commune (supp. Codex, 1955) du (\pm) (cyclohexyl-3 hydroxy-3 phényl-3 propyl)-1 méthyl-1, pyrrolidinium.
- tridécanal**, n. m. = ALDÉHYDE TRIDÉCYLIQUE.
- tridécanène**, n. m. — Carbone saturé $\text{H}_3\text{C}-(\text{CH}_2)_{11}-\text{CH}_3$. F : $-5,5^\circ\text{C}$; Eb : 234°C .
- tridécanedioïque**, n. m. = BRASSILIQUE (acide).
- tridécanoïque**, n. m. = ACIDE TRIDÉCYLIQUE.
- tridécanol-1**, n. m. = ALCOOL TRIDÉCYLIQUE.
- tridécanone-2**, n. f. = MÉTHYLUNDÉCYLÉTONE.
- tridécene-1**, n. m. — Carbone de f. $\text{C}_{13}\text{H}_{26}$ ou $\text{CH}_3-(\text{CH}_2)_{10}-\text{CH}=\text{CH}_2$. F : $-22,2^\circ\text{C}$; Eb₁₀ : 102°C ; Eb₇₆₀ : 233°C .
- tridécanoïque**, n. m. — Nom donné à trois acides éthyléniques $\text{C}_{13}\text{H}_{24}\text{O}_2$, à savoir, les dérivés possédant la double liaison en 2, en 11 et en 12.
- tridécyl**, — Préfixe désignant la présence du substituant $-\text{CH}_2-(\text{CH}_2)_{11}-\text{CH}_3$.
- tridécylamide**, n. m. — Amide primaire $\text{H}_3\text{C}-(\text{CH}_2)_{11}-\text{CONH}_2$.
- tridécylamine**, n. f. — Amine primaire $\text{H}_3\text{C}-(\text{CH}_2)_{12}-\text{NH}_2$.
- tridécylène**, n. m. — V. tridécene.
- tridécylrique**, adj. — Se dit de l'alcool primaire $\text{H}_3\text{C}-(\text{CH}_2)_{11}-\text{CH}_2\text{OH}$.
- tridécanol-1**, || Se dit aussi de l'aldéhyde correspondant $\text{H}_3\text{C}-(\text{CH}_2)_{11}-\text{CHO}$, utilisé en parfumerie pour modifier les bouquets. || Se dit de l'acide correspondant $\text{H}_3\text{C}-(\text{CH}_2)_{11}-\text{COOH}$.
- tridécylphosphorique**, adj. — Se dit de l'acide $\text{H}_2\text{PO}_4(\text{C}_{13}\text{H}_{27}) + \text{HPO}_4(\text{C}_{13}\text{H}_{27})_2$ à parties égales; produit visqueux pour séparation des minerais par flottation; antistatique pour textiles.
- trideuto-acétique**, adj. — Se dit de l'acide de f. CD_3-COOH .
- Tridione®**, n. f. — Nom déposé pour triméthadione.
- tridissimulé**, adj. — Se dit du sulfate de chrome de f. $[\text{Cr}_2(\text{SO}_4)_3] \cdot 6\text{H}_2\text{O}$.
- Tridite®**, n. f. — Marque d'un explosif brisant pour obus; acide picrique 80 %, dinitrophénol 20 %.
- tridymite**, n. f. — Variété cristalline de silice SiO_2 , se présentant sous une forme α orthorhombique au-dessous de 163°C , β hexagonale au-dessus. = ASMANITE.
- Triéline®**, n. f. — Marque de trichlorure d'éthylène.
- triérucine**, n. f. = ÉRUCINE.
- triester**, n. m. — Corps possédant trois fois la fonction ester.
- triéthanolamine**, n. f. — Liquide huileux noircissant à l'air, de f. $\text{N}(\text{CH}_2-\text{CH}_2\text{OH})_3$. Ses esters ont des propriétés émulsionnantes.
- triéthanométhamine**, n. f. = TRÉTAMINE.
- triéthénique**, adj. — Se dit des acides à trois doubles liaisons éthyléniques $\text{C}_n\text{H}_{2n-6}\text{O}_2$.
- triéthoxyméthane**, n. m. = ÉTHER DE KAY.
- triéthoxysilicium-éthyle**, n. m. — Composé de f. $\text{C}_2\text{H}_5\text{Si}(\text{OC}_2\text{H}_5)_3$.
- triéthylamine**, n. f. — Amine tertiaire $(\text{C}_2\text{H}_5)_3\text{N}$. F : $-115,3^\circ\text{C}$; Eb : $89,7^\circ\text{C}$; catalyseur, inhibiteur de corrosion, durcisseur de polymères.
- triéthylaminoxide**, n. m. — Radical $(\text{C}_2\text{H}_5)_3\text{N}=\text{O}$ connu par son hydroxyde $(\text{C}_2\text{H}_5)_3\text{N}(\text{OH})_2$.
- triéthylarsine**, n. f. — Arsine de f. $\text{As}(\text{C}_2\text{H}_5)_3$.
- triéthylbenzène**, n. m. — Nom donné à trois isomères $\text{C}_6\text{H}_5(\text{C}_2\text{H}_5)_3$.
- triéthylbismuthine**, n. f. = BISMUTH-TRIÉTHYLE.
- triéthylborane**, n. m. — Corps de f. $(\text{C}_2\text{H}_5)_3\text{B}$, F : -93°C ; Eb : 95°C ; combustible pour fusées.
- triéthylcarbinol**, n. m. — Liquide d'odeur camphrée $(\text{C}_2\text{H}_5)_3\text{C}-\text{OH}$. Eb : $140-2^\circ\text{C}$.
- triéthyle**, n. m. — Se rapporte à des corps, éthers-sels notamment, contenant trois fois le groupement éthyle. Ex. : borate de tri-éthyle $\text{B}(\text{OCH}_2-\text{CH}_3)_3$. || Phosphate de —, n. m. — Corps de f. $\text{PO}_4(\text{C}_2\text{H}_5)_3$ plastifiant des vernis.
- triéthylènediamine**, n. f. — Composé hétérocyclique de f. $\text{N} \equiv (\text{CH}_2-\text{CH}_2)_3\text{N}$. F : 158°C ; Eb : 174°C .
- triéthylèneglycol**, n. m. — Substance de f. $\text{HO}-\text{CH}_2-\text{CH}_2-\text{O}-(\text{CH}_2)_2-\text{O}-\text{CH}_2-\text{CH}_2-\text{OH}$; accroît la pliability des plastiques.
- triéthylèneméthamine**, n. f. = TRÉTAMINE.
- triéthylènetétramine**, n. f. — Corps de f. $\text{NH}_2(\text{C}_2\text{H}_4-\text{NH})_2-\text{C}_2\text{H}_4-\text{NH}_2$. F : 12°C , Eb : $277,5^\circ\text{C}$; agent de synthèse pour colorants, pour détersifs.
- triéthylhydrazonium**, n. m. — Radical monovalent $\text{NH}_2-\text{N}(\text{C}_2\text{H}_5)_3$.
- triéthylidène-glycol**, n. m. — Glycol de f. $\text{C}_6\text{H}_{14}\text{O}_4$ ou $\text{HOCH}_2-\text{CH}_2-\text{O}-\text{CH}_2-\text{CH}_2-\text{O}-\text{CH}_2-\text{CH}_2-\text{OH}$.
- triéthylidène sulfone**, n. f. — Composé de f. $(\text{CH}_3-\text{CHSO}_2)_3$.
- triéthylidène-sulfure-disulfone**, n. f. — Composé de f. $(\text{CH}_3-\text{CH})_2(\text{SO}_2)_2\text{S}$.
- triéthylméthane**, n. m. = ÉTHYL-3 PENTANE.
- N,N-triéthylphényléthylènediamine**, n. f. — Corps de f. $(\text{C}_6\text{H}_5)(\text{C}_2\text{H}_5)_3\text{N}-\text{CH}_2-\text{CH}_2-\text{N}(\text{C}_2\text{H}_5)_2$. Médicament antihistaminique de synthèse.
- triéthylphosphine**, n. f. — Composé de f. $(\text{C}_2\text{H}_5)_3\text{P}$. Réactif du sulfure de carbone (cristaux rouges).
- triéthylsilicol**, n. m. — Silicol tertiaire $(\text{C}_2\text{H}_5)_3\text{Si}-\text{OH}$.
- triéthylstibine**, n. f. — Liquide de f. $\text{Sb}(\text{C}_2\text{H}_5)_3$.
- triéthylsulfonium**, n. m. — Cation monovalent $[(\text{C}_2\text{H}_5)_3\text{S}]^+$. Ex. : platichlorure de triéthylsulfonium $[(\text{C}_2\text{H}_5)_3\text{S}]_2[\text{PtCl}_6]$.
- trieuite**, n. f. — Variété d'hétérogénéite.
- trieur**, n. m. — Appareil industriel servant à séparer deux solides : coke du mâchefer, minéral de la gangue, graines de la menue paille, etc.
- triferrihexa-acétato**, n. m. — Nom générique des complexes renfermant le cation trivalent $[\text{Fe}_3(\text{CH}_3-\text{CO}_2)_6]^3+$.

Report No. 70

**ETHYLENE GLYCOLS,
GLYCOL ETHERS
AND ETHANOLAMINES**

by **HAROLD W. SCHEELINE**

August 1971

A private report by the

PROCESS ECONOMICS PROGRAM



STANFORD RESEARCH INSTITUTE

MENLO PARK, CALIFORNIA

Glycol Ethers (338221, 338222)

In general, the glycol ethers have a relatively low level of toxicity, and present no serious health hazards in industrial handling and use at ordinary room temperatures. If large amounts are swallowed, injury may result, but single dose oral toxicity is low. Prolonged, extensive skin contact may cause ill effects from absorption. As with nearly all solvents, prolonged inhalation of sufficiently high concentrations of the vapors can cause adverse effects, so adequate ventilation should be provided.

The glycol ethers are also noncorrosive and do not readily solidify, so their handling and storage presents no unusual problems. They are easily stored in bulk, using ordinary steel tanks. Aluminum and aluminum alloys should be avoided. Plastic- or rubber-lined tanks are not recommended because of the high solvency of the glycol ethers. Because they are hygroscopic, storage for long periods in tanks with open vents should be avoided; pressure-vacuum breathers are recommended.

Ethanolamines (338240)

The ethanolamines are not highly toxic. While serious effects could result if ethanolamines are swallowed in substantial quantities, and the concentrated materials in particular could injure the mouth and digestive tract, there is no appreciable hazard from ingestion incidental to normal industrial use. Vapor inhalation at ordinary temperatures presents no unusual problems.

The ethanolamines are irritating to the eyes and skin. Monoethanolamine may cause serious eye injury, being strongly alkaline; the undiluted material attacks the eyes about as strongly as acetic anhydride or ammonium hydroxide. Full face shields or suitable goggles should be worn when working with any of the ethanolamines.

Ordinary steel tanks are satisfactory for storage unless coloration of the product cannot be tolerated. Three or four months' storage in steel or black iron will result in 30 to 40 ppm of iron pickup, and